Section: Cardiology

Systematic Review

ANGIOGRAPHIC PROFILES IN YOUNG ADULTS WITH ACUTE CORONARY SYNDROME: UNRAVELING THE UNIQUE CHARACTERISTICS AND IMPLICATIONS FOR DIAGNOSIS AND MANAGEMENT - A SYSTEMATIC REVIEW

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Abstract

Background: Cardiovascular disease (CVD) is a leading cause of mortality globally and in India, with a distinct epidemiological transition contributing to the increasing prevalence of coronary artery disease (CAD) among young adults. Limited data exist on the demographic and angiographic characteristics of young patients with acute coronary syndrome (ACS). This systematic review aimed to bridge this gap by evaluating recent studies to identify ACS's clinical and angiographic profile. **Aim:** To systematically review and analyse data from studies conducted between 2015 and 2023, focusing on angiographic characteristics in individuals aged 18–45 diagnosed with ACS. **Material & Methods:** A comprehensive search was conducted using electronic databases, including PubMed, MEDLINE, Embase, and the Cochrane Library. Eligible studies were published in English from 2015-2023, addressing angiographic profiles in young adults with ACS. Data synthesis and analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. **Results:** Six studies met the inclusion criteria and presented recent findings on young Indian adults. Prevalent risk factors include obesity, diabetes, hypertension, and smoking. Angiographic profiles revealed Left Anterior Descending (LAD) artery involvement in the majority of cases, with single-vessel disease (SVD) being the predominant pattern. Obesity and diabetes are significantly associated with triple-vessel disease (TVD). **Conclusion:** This systematic review provides comprehensive insights into the angiographic profile of ACS in young Indian adults. Obesity has emerged as a significant risk factor for coronary involvement. The distinct angiographic patterns observed underscore the need for tailored diagnosis and management strategies.

INTRODUCTION

Cardiovascular disease (CVD) is the predominant cause of mortality globally and in India, accounting for approximately 25% of all fatalities.[1] Indians manifest coronary artery disease (CAD) a decade earlier than their Western counterparts.[2,3,4] In 2016, India incurred an estimated premature loss of 62.5 million years due to CVD.[1] Epidemiological transition contributes to an increased prevalence of CAD among young adults.[5] The term "young" patients with CAD is designated by an age cut-off of 40 years [6]. Distinct clinical and risk factor profiles and coronary artery involvement patterns distinguish young CAD patients from their elderly counterparts.[7,8] Young CAD patients exhibit a favourable prognosis, marked by the prevalence of single-vessel disease (SVD), with prominent risk factors such as smoking, familial history of CAD, and hypercholesterolaemia.[9] Coronary atherosclerosis, constituting 80% of all cases, is the predominant cause of CAD in young individuals.[7] Less frequent aetiologies among young adults include coronary vasospasm, medium-vessel vasculitis, hypercoagulable states, substance abuse, and embolism.[7] Despite the relatively positive

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prognosis of CAD in the young, it engenders significant morbidity, psychological repercussions, financial implications, and a more substantial loss of Disability-Adjusted Life Years (DALYs), given the impact on the productive age demographic.[10] The prevalence of CAD in young individuals ranges from 5% to 7% in diverse registries.[11]

Studies have indicated that the risk of coronary artery disease (CAD) among Asian Indians is notably elevated, being 3–4 times higher than in white Americans, six times higher than in Chinese individuals, and 20 times higher than in their Japanese counterparts.[12] A conservative estimate posits that India may harbour approximately 30 million patients with CAD. If prevailing trends persist, the burden of CAD in India is expected to surpass that in other global regions by 2020 (5). Moreover, beyond the elevated prevalence, evidence suggests that Indian individuals may experience CAD onset at a significantly early age [13].

More than half of cardiovascular disease-related deaths occur in individuals below the age of 50, and one-fourth of acute myocardial infarction cases are reported in patients under the age of 40.[12] It has been observed that the clinical presentation, risk factor profile, and coronary anatomy of young CAD patients differ from those of older CAD patients.[14,12,8] Collectively, these studies indicate that patients with an early onset of CAD exhibit a preponderance of single-vessel disease and a dominance of coronary risk factors, such as hypercholesterolaemia, a family history of CAD, and cigarette smoking, compared to their older counterparts.

In younger individuals, the occurrence of coronary artery disease (CAD) is more pronounced among those with relatively recent onset diabetes mellitus (DM). The CAD spectrum encompasses chronic stable angina, unstable angina, non-ST-elevation myocardial infarction (NSTEMI), and ST-elevation myocardial infarction (STEMI). Clinical manifestations vary according to the specific spectrum.[15] Contrary to the older age group, typical anginal pain and pre-admission dyspnoea are less commonly observed in the younger age group with CAD, as indicated by a consensus in both Western and Indian literature.[16] This disparity contributes to delayed hospital admissions among many of these patients, consequently leading to an escalation in morbidity and mortality rates. Therefore, it is essential to exercise caution and conduct additional assessments on young patients with atypical symptoms, especially those with risk factors such as diabetes and smoking. It is worth mentioning that SVD and LAD artery involvement are more commonly seen in younger individuals.[17]

The 2023 ESC guidelines also recommend extensive intervention and treatment plans for the management of ACS. The recommendations outlined guidelines for managing suspected ST-elevation myocardial infarction (STEMI) patients. In cases of hypoxaemia (SaO2 <90%), oxygen supplementation is recommended, whereas routine oxygen is discouraged for patients without hypoxaemia (SaO2 >90%). Symptom management involves considering intravenous opioids for pain relief and mild tranquillisers for patients with high anxiety. Intravenous beta-blockers, particularly metoprolol, are recommended for patients undergoing primary percutaneous coronary met. Pre-hospital logistics emphasises establishing regional networks for efficient reperfusion therapy delivery, 24/7 PPCI-capable centres, direct transfer of patients to catheterisation laboratories, and bypassing non-PCI centres. Emergency medical services (EMS) are encouraged to identify ECG patterns suggestive of acute coronary occlusion and administer appropriate initial therapy. Additionally, recording and auditing of delay times by all involved entities are recommended to achieve and maintain quality targets in caring for patients with suspected STEMI.[18]

However, there are limited available data on the comparison of demographic and angiographic characteristics in young patients stratified according to the type of acute coronary syndrome. The current systematic review aimed to evaluate data from various studies to identify the clinical and angiographic profiles of ACS in young adults.

MATERIALS AND METHODS

Data Collection

A comprehensive search was conducted across electronic databases, including PubMed, MEDLINE, Embase, and Cochrane Library, using a predefined set of keywords and Medical Subject Headings (MeSH) terms. The search focused on studies published from inception to the present, exploring the angiographic profiles of young adults with acute coronary syndrome (ACS).

Eligibility Criteria

Inclusion criteria included studies addressing angiographic characteristics in individuals aged 18–45 diagnosed with ACS. The relevant study types included retrospective observational studies, clinical trials, and case-control studies. Only studies published in English between 2015-2023 were considered.

Data Extraction

Two independent reviewers screened titles and abstracts for eligibility. The selected full-text articles underwent standardised data extraction. Extracted data included the study design, sample size, participant demographics, angiographic findings, and any unique characteristics observed in the angiographic profiles of young adults with ACS.

Data Synthesis and Analysis

The extracted data were synthesised to identify common themes and trends in angiographic profiles among young adults with ACS.

Implications for Diagnosis and Management

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The unique characteristics identified in the angiographic profiles were critically analysed to elucidate their implications for diagnosing and managing ACS in young adults. Recommendations for clinical practice and future research directions are discussed.

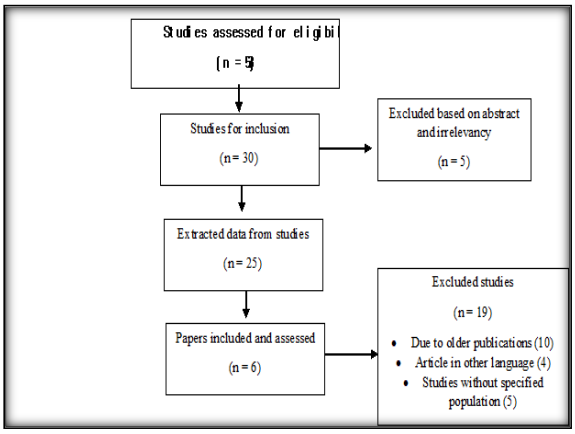
Reporting

The systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and completeness in reporting the review process and findings.

Ethical Considerations

Ethical approval was not required as this study involved the analysis of previously published data. However, adherence to ethical standards and patient confidentiality were maintained throughout the review process.

CONSORT FLOW FOR SELECTION OF STUDIES



RESULTS

Six studies were included in the review, including recent findings and angiographic profile data from 2015 to 2023.

Recent findings in Indian young adults

Association of participant characteristics with involved coronaries

Among the 200 participants, the ages of the patients ranged from 26 to 45 years, with a median age of 43. Approximately 70.5% of patients were age group 41-45 years. The proportion of males in the participant population was higher than that of females, accounting for 78.5% compared to 21.5%. Interestingly, age, sex, BMI, and LVEF were not significantly different among the SVD, DVD, and TVD groups. However, lower LVEF was observed in individuals with TVD.[19]

The study findings from Chhabra et al. also reported a higher prevalence of ACS among male patients in younger adults (92.1%) and in adult patients (76.5%). In addition, most patients had a high BMI, elevated cholesterol levels (52.6%), and a chronic history of smoking (30.7%). The study also reported that the patients with ACS were mainly from urban areas (76.3%).[20] Among 117 young adults, 81.1% were male, and 18.8% were female.[21] Similarly, Revaiah et al. reported that the mean age of the study population was 35.5 ± 4.7 years. 96.2% were males.[22] In contrast, Deshmukh reported a mean of 27 ± 2.8 years.[23] The average age of the patients was 35.1 years, with a standard deviation of 4.4 years. Most of the study sample consisted of men, accounting for 86.2% of the participants, whereas 54.8% were from rural areas.[24]

Risk Factor Distribution

Data from a single-centre cross-sectional study reported significant findings, where common risk factors for ACS included obesity (48%), diabetes mellitus (32%), hypertension (29.5%), smoking (15.5%), alcoholism (11%), and family history of premature CAD (3%). One-fourth of the patients had no identifiable risk factors. The study detailed the distribution of risk factors across sexes.[19] ACS can be associated with obesity, as most studies have reported similar findings, where the prevalence of ACS was higher in obese patients.

To support these results, we can refer to a retrospective record-based study that analysed patient characteristics and outcomes over 12 years. The study divided the patients (N=35,259) into two groups: Group I, comprising 114 patients aged 20-30 years, and Group II, comprising 35,145 patients aged >30 years. The study findings revealed a significant association between obesity and ACS in the younger age group (P <0.001), attributed to an increasing trend in the population. Furthermore, the study indicated that comorbidities, such as diabetes (42.7%) and hypertension (51.1%), were more prevalent in the older age group. Notably, the incidence of hypercholesterolaemia was higher in the younger age group, comprising 28.1% of the overall study population (p = 0.05). This is one of the largest retrospective studies on a young Indian population involving major tertiary care centers. However, this study also reported that obesity is a modifiable risk factor that can be managed based on lifestyle habits. Other risk factors, such as smoking, alcohol consumption, and drug abuse, were higher in young adults (p <0.05).[20]

A retrospective observational study conducted between 2015 and 2020 reported similar results. Among the 117 patients, the risk factors for ACS were hypertension (30.76%), diabetes (21.36%), family history of CAD (9.40%), smoking (7.69%), and dyslipidaemia (7.60%). However, the incidence of obesity (1.70%) was low in this study due to geographical differences and the lifestyle of the specific population.[21] An epidemiological study from a tertiary care centre in India also reported similar risk factors in 182 patients aged <40. The prevalent risk factors identified were smoking (56%), hypertension (29.7%), family history of premature coronary artery disease (18.2%), and diabetes (15.9%).[22] A recent cross-sectional hospital-based single-centre study of 41 patients (>30 years) reported that male sex (95.1%),

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dyslipidaemia (51.2%), tobacco consumption (48.8%), obesity (34.1%), and smoking (29.3%) were the most prominent risk factors for ACS.[23] The study conducted by Maroszyńska-Dmoch et al. in South Africa also reported similar findings, where the most common risk factors for ACS or CAD were obesity, dyslipidaemia, smoking, and lipid abnormalities.[24]

The data presented underscores the critical role of specific risk factors in acute coronary syndrome (ACS). Obesity is a prominent and modifiable risk factor, with a substantial prevalence of 48% among patients with ACS. This aligns with the broader patterns reported in various studies, emphasising the need for targeted interventions addressing obesity to potentially reduce the incidence of ACS, especially in the younger age group.

This extensive retrospective study corroborates the association between obesity and ACS, particularly in younger individuals. It provides valuable insights into age-specific risk profiles, with comorbidities, such as diabetes and hypertension, being more prevalent in older patients with ACS. Identifying hypercholesterolaemia as more common in the younger age group suggests the complexity of the risk factor distribution and necessitates tailored approaches to address diverse age groups. Geographical and lifestyle variations have been acknowledged in diverse studies, emphasising the need for region-specific interventions.

Coronary angiography profile

The Left Anterior Descending (LAD) artery was the most commonly affected coronary artery, present in 77% of patients. This was followed by the Right Coronary Artery (RCA) in 30.5% of the patients and the Left Circumflex (LCx) in 29.5%. Of the patients who underwent coronary angiography (CAG), 69.5% had single-vessel disease (SVD), 24% had double-vessel disease (DVD), and 6.5% had triple-vessel disease (TVD). In patients with SVD, LAD involvement was the most common (50%), followed by RCA involvement (12.5 %) and LCx involvement (7 %). LAD and LCx involvement were the most common in patients with DVD (12.5 %), followed by LAD and RCA involvement (8 %) and RCA and LCx involvement (3.5 %).[19]

Data from the 12-year analysis revealed that 42 (36.84%) patients had a normal ejection fraction (LVEF: 50–70%), 32 (28.07%) had mild LV dysfunction, 36 (31.57%) had moderate LV dysfunction, and 4 (3.5%) had severe LV dysfunction. In the ACS spectrum, 87 (76.3%) patients in group I had STEMI, 11 (9.6%) had NSTEMI, and 16 (14%) had UA. Of those with STEMI, 64 (73.56%) had AWMI and 23 (26.43%) had inferior wall myocardial infarction (IWMI). Among the 87 patients with STEMI, 42 presented late after the window period, with 12 (28.5%) still exhibiting recanalised coronary arteries. The Left Anterior Descending Artery (LAD) was involved in 52 patients (45.6%), the Right Coronary Artery (RCA) in 16 patients (14%), and the left circumflex artery in 15 patients (13.2%). In terms of coronary involvement, 52 patients (45.6%) had single-vessel disease (SVD), 14 patients (12.2%) had double-vessel disease (DVD), and only one patient (0.87%) presented with triple-vessel disease (TVD). [20] However, in a tertiary retrospective study, among 117 cases reported, ST-segment elevated myocardial infarction in 67 (57.2%) patients, non-ST segment elevated myocardial infarction in 10 (8.5%), and unstable angina in 13 (11.1%) patients. A total of 27 (23%) underwent angiography for chronic stable angina.[21]

Revaiah et al. reported similar findings: SVD was the most common angiographic pattern, and LAD was the most commonly involved vessel in patients with STE-ACS. Of 149 patients with STE-ACS, 51.7% underwent thrombolysis. More than half of the patients underwent revascularisation, with PCI being the most common method. Only 3% of the patients underwent primary PCI. All patients with ACS were successfully discharged from the hospital, with no in-hospital mortality. During a three-month follow-up, four patients were readmitted with acute decompensated heart failure (ADHF), and all four patients had severe left ventricular systolic dysfunction. Unfortunately, one of the four patients with ADHF died of refractory cardiogenic shock.[22,23] In a study by Deshmukh et al., Obstructive CAD with SVD was the most common angiographic diagnosis. The LAD was the most frequently affected vessel, followed by the RCA. The percentages of DVD and TVD were very low, and no cases of LMCA disease were observed. Only 2 of 44 patients (4.87%) had spontaneous coronary artery dissection, while seven patients (17.1%) had diseased non-culprit vessels. Interestingly, only four patients (9.75%) had more than one lesion in the culprit vessel.[24]

From 239 patients from the South African region, obstructive CAD, characterised by vessel lumen stenosis greater than 50%, was identified in 118 patients (49.4% of the total), including 13.4% with stenosis between 50-90% and 36% with stenosis of ≥ 90%. The mean stenosis for those with obstructive CAD was 75.4% and 95.9% for those with ≥ 90% stenosis. A total of 50.2% of the study population had no coronary artery stenoses (zero-vessel disease), whereas 37.2% of patients with a CAD diagnosis and 16.9% of those with ACS had a normal coronary angiogram. Single-vessel disease was the most common, accounting for 61.9% of cases. The LAD artery was the most commonly affected location (61.6%), followed by the RCA (27.4%).[25]

Association between CV Risk Factors with **Coronary Involvement**

Obesity and diabetes were both significantly linked to TVD compared to SVD and DVD, with 76.9% of patients with TVD having obesity and 76.9% with diabetes. In comparison, only 48.2% of SVD and 39.6% of DVD patients had obesity, and 27.3% and 33.3% had diabetes, respectively. However, the

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proportion of patients with TVD with hypertension (38.5%) was not significantly different from those with SVD and DVD (27.3% and 33.3%, respectively). Alcoholism was more common in patients with TVD (23.1%) than in those with SVD and DVD (7.2% and 18.8%, respectively), but the differences were not statistically significant. Smoking status and family history of premature CAD did not vary significantly between the groups.[19]

The results from Chhabra et al.'s study revealed that among the young adult group (group I), 76.3% of patients and 39.3% of the elderly group II (p=0.001) experienced STEMI. In contrast, more patients in group II experienced NSTEMI. The younger group had a higher prevalence of SVD (45.6% vs. 33.9%; p=0.013), whereas the older group had significantly higher rates of DVD (26.4% vs. 12.3%; p=0.001) and TVD (27.8% vs. 0.9%; p=0.001). Additionally, more patients in group I had recanalised coronary arteries (42.1% in group I vs. 3% in group II; p=0.001). [20] The study from Prakash B did not report an analysis of the association of CV risk factors with coronary involvement. [21] In addition to this, the other studies were included in this review.

Current diagnosis and management

Acute-phase management of ACS

The initial task in managing ACS in young adults is to select an invasive strategy that can be characterised based on clinical conditions. Figure 1 shows the standard treatment proposed by the European Society of Cardiology 2023.[18]

i. Patients warranting a Preliminary ST-segment elevation myocardial infarction (STEMI) diagnosis. Such individuals should undergo prompt triage for reperfusion therapy, specifically a primary percutaneous coronary intervention (PPCI) approach or fibrinolysis if PPCI cannot be initiated within 120 min of diagnosis.

Or

ii. Patients with a preliminary diagnosis of non-ST-segment elevation ACS (NSTE-ACS). Recommendations for these patients include the following.

Therefore, an invasive strategy is advised during hospitalisation.

Immediate invasive strategies are recommended for high-risk features.

An early (i.e. within 24 h) invasive strategy is warranted when identifying high-risk features.

Recommendations	Class[a]	Level[b]
Hypoxia		
Oxygen is recommended in patients with hypoxaemia (SaO_2 <90%).	I	C
Routine oxygen is not recommended in patients without hypoxaemia (SaO_2 >90%).[148,172]	III	A
Symptoms		
Intravenous opioids should be considered to relieve pain.	IIa	C
A mild tranquilizer should be considered in very anxious patients.	IIa	C
Intravenous beta-blockers		
Intravenous beta-blockers (preferably metoprolol) should be considered at the time of presentation in patients undergoing PPCI with no signs of acute heart failure, an SBP >120 mmHg, and no other contraindications.[163–167,169]	IIa	A
Pre-hospital logistics of care		
It is recommended that the pre-hospital management of patients with a working diagnosis of STEMI is based on regional networks designed to deliver reperfusion therapy expeditiously and effectively, with efforts made to make PPCI available to as many patients as possible.[145]	I	B
It is recommended that PPCI-capable centres deliver a 24/7 service and are able to perform PPCI without delay.[173,174]	I	B
It is recommended that patients transferred for PPCI bypass the emergency department and CCU/ICU and are transferred directly to the catheterization laboratory.[137,175–178]	I	B
It is recommended that EMS transfer patients with suspected STEMI to a PCI-capable centre, bypassing non-PCI centres.	I	C

Figure 1: recommendation for ACS initial management,[18] *This figure is from the ESC guidelines 2023, which is under no copyright claim and can be used with adequate credit and citation

ACS management with an invasive strategy

The implementation of invasive management strategies is contingent on timely intervention. It is strongly advised that patients designated for an immediate invasive strategy, characterised by a high suspicion of an ongoing acute coronary artery occlusion (such as persistent ST-segment elevation or equivalents) or those with non-ST-segment elevation acute coronary syndrome (NSTE-ACS) exhibiting any high-risk characteristics, undergo emergency angiography at the earliest feasible moment. For individuals identified as high-risk NSTE-ACS patients, meeting criteria such as being diagnosed with NSTEMI per the 0 h/1 h or 0 h/2 h ESC algorithms, presenting dynamic ST-segment or T-wave changes, demonstrating transient ST-segment elevation, or possessing a Global Registry of Acute Coronary Events (GRACE) risk score

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exceeding 140, serious consideration should be given to an early invasive strategy. This involved the initiation of angiography within the first 24 hours of diagnosis.[18-20]

Figure 1 visually represents the management strategies and corresponding pathways for STEMI patients requiring MI revascularisation. The depiction shows different modes of intervention, including percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG), as well as their respective pathways.

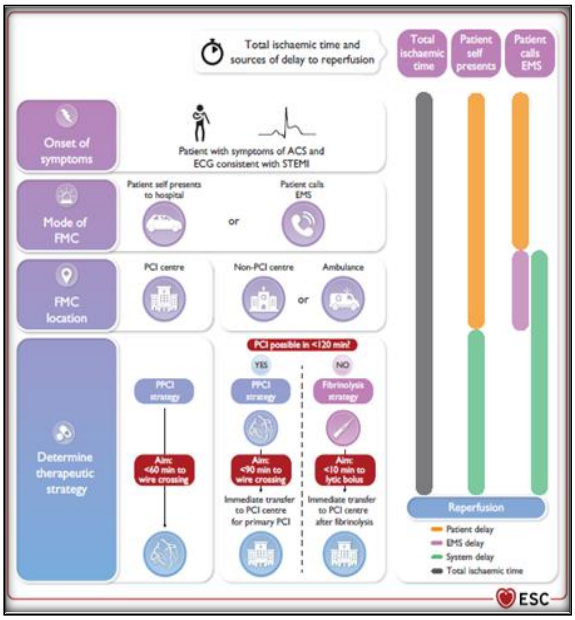

Figure 2: Clinical pathways for ACS management. Represented in the ESC 2023 guidelines

DISCUSSION

This systematic review synthesised data from six studies between 2015 and 2023, revealing crucial insights into the angiographic profiles of young adults with acute coronary syndrome (ACS) in India. The age distribution within this cohort, spanning 26–45 years, highlighted a predominant occurrence of ACS in individuals aged 41-45, with males constituting a significant majority. Notably, participant characteristics such as age, sex, body mass index (BMI), and left ventricular ejection fraction (LVEF) did not differ significantly among patients with single-vessel disease (SVD), double-vessel disease (DVD), and triple-vessel disease (TVD).[19-24]

Several risk factors are prevalent among young adults with ACS. Obesity has emerged as a significant and modifiable risk factor, with a prevalence of 48%. This finding aligns with similar patterns reported in various studies, emphasising the need for targeted interventions to address obesity in younger populations, potentially reducing the incidence of ACS. Additionally, the prevalence of diabetes, hypertension, smoking, and alcoholism varies across studies, providing a comprehensive understanding of the multifaceted risk factor landscape in this population.[14,15]

Coronary angiography revealed the most commonly affected coronary arteries, with the Left Anterior Descending (LAD) artery being the predominant site. Single-vessel disease (SVD) was the most prevalent angiographic pattern, with the LAD being the most frequently involved vessel. These findings underscore the need for nuanced diagnostic and management strategies tailored to distinctive angiographic profiles of young adults with ACS.[19,20]

Association analyses between cardiovascular risk factors and coronary involvement revealed significant links between obesity and diabetes with triple-vessel disease (TVD). This emphasises the role of specific risk factors in shaping the angiographic patterns observed in patients with ACS. Furthermore, the analysis highlighted the varied prevalence of risk factors across different angiographic patterns, contributing to a more nuanced understanding of the interplay between risk factors and coronary involvement.[19, 21-23]

The studies in this systematic review also provide valuable insights into the acute-phase management of ACS in young adults. Recommendations for invasive strategies, including primary percutaneous coronary intervention (PPCI) and fibrinolysis, were detailed based on clinical presentation, highlighting the importance of prompt diagnosis and intervention. This review's synthesis of recent findings and data contributes substantially to refining the understanding of ACS in young adults, aiding in developing targeted and effective management strategies.

Implications

The implications of these findings are multifaceted. First, the identified prevalence of obesity as a significant risk factor for ACS in young adults emphasises the urgent need for preventive interventions that target lifestyle modifications and weight management. Public health initiatives should prioritise interventions addressing obesity to reduce the burden of ACS in this population.

Moreover, the distinct angiographic profiles observed, including the prevalence of SVD and the frequent involvement of LAD, underscore the importance of tailoring diagnostic and interventional approaches for young adults. Clinicians should be aware of these patterns to enhance the precision of diagnostic strategies and guide appropriate interventions.

The identified association between specific risk factors and coronary involvement, particularly the association between obesity, diabetes, and TVD, provides a basis for risk stratification. Risk assessment models can be refined to account for these associations, enabling more accurate prognostication and personalised management plans. Comprehensive analysis of recent data also serves as a foundation for further research and exploration of the mechanisms underlying ACS in young adults.

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Future studies should delve into the molecular and genetic factors contributing to the observed angiographic profiles, paving the way for targeted therapeutic interventions.

Table 1: Distribution of recent findings depicting the clinical characteristics of young adult patients

Study	Age cut-off (Years)	Males (%)	STE-ACS Vs NSTE-ACS (%)	Thrombolysis (%)	CAG/PCI (%)	Normal Coronaries (%)	Cardiogenic shock (%)	In-hospital mortality (%)
Prajapati et al.[14] (n = 100), 2015	40	96%	85% vs 15%	NA	100% vs NA	22%	NA	NA
Deora et al[25] (n = 820), 2016	40	93%	75% vs 26%	NA	100% vs NA	33%	NA	NA
AMIYA study[26] (n = 1116), 2017	30	95%	100% STE-ACS	55.50%	95% vs 55%	5.20%	4.90%	2.90%
Deshmukh et al. [23] (n = 41), 2019	30	95%	100% STE-ACS	61%	100% vs 56%	7.30%	–	2.40%
Gupta et al. [27] (n = 102), 2020	35	97%	91% vs 8.8%	32.30%	95% vs 37%	3.10%	1%	2.90%

Limitations

Despite valuable insights from this systematic review, certain limitations should be acknowledged. The relatively small number of studies included, and the potential heterogeneity in methodologies and participant characteristics across studies may influence the generalisability of the findings. Additionally, variations in definitions, diagnostic criteria, and data collection methods among the included studies could have introduced bias and limited the comparability of the results.

The retrospective nature of some studies may be prone to selection and recall biases, impacting the accuracy of the reported risk factors and angiographic patterns. Furthermore, reliance on data from specific regions in India may limit the generalisability of the findings to other geographical locations with diverse populations and risk factor distributions.

CONCLUSION

In conclusion, this systematic review comprehensively synthesises recent angiographic profile findings in young adults with acute in India. The prevalence of obesity has emerged as a key risk factor influencing angiographic patterns. The distinct profiles of single-vessel disease, predominant LAD involvement, and specific associations between the risk factors and coronary involvement underscore the need for tailored diagnostic and management strategies. The implications of these findings extend to preventive interventions, risk stratification, and avenues for future research to understand the complexities of ACS among young adults. Despite these limitations, this systematic review provides valuable insights into this demographic's evolving landscape of cardiovascular health.

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